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THE DURATION OF GEMINATE CONSONANTS IN INDONESIAN AND IN THAI

Yukie Masuko* and Shigeru Kiritani

Introduction

It is said that both Indonesian and Thai have geminate consonants; geminate stops have a longer period of closure than single stops, and geminate nasals have a longer period of nasal murmur than single nasals. These geminate consonants are supposed to be similar to Japanese geminate consonants, but the same, since Indonesian and Thai learners of Japanese have some difficulty in learning the Japanese geminate consonants.

Before examining the differences between Japanese and Indonesian or Thai, we decided to measure the duration of geminate consonants in Indonesian and in Thai to observe their appearance.

Procedure

Words and phrases were chosen to be measured.

Indonesian

The words and phrases examined were made up of two, or more than two syllables, of the form C1V1C2V2 (C2=p, pp, t, tt, k, kk, m, mm, n, nn, ŋ, ŋŋ). A C2V2 syllable could be closed by adding a consonant after V2, and there were some words which lacked C1. In Indonesian, geminate consonants do not appear within a single morpheme, but appear at morpheme boundaries. There are no minimal pairs. We made materials using meaningful words with phonetic conditioning environments as similar as possible.

There were two cases for single consonants:

1 M1 M2
C1V1C2 # V2

The morpheme boundary was between C2 and V2, which were the last consonant of morpheme 1 and the initial vowel of morpheme 2, respectively.

2 M1 M2
C1V1 # C2V2

The morpheme boundary was between V1 and C2, which were the last

*Tokyo University of Foreign Studies

vowel of morpheme 1 and the initial consonant of morpheme 2, respectively.

In the materials there was one word of case 1; the others were case 2.

Thai

The words and phrases examined were made up of two, or more than two syllables, of the form C1V1C2V2 (C2=p, pp, pph, t, tt, tth, k, kk, kkh, m, mm, n, nn, ŋ, ŋŋ). Thai has a distinction between long vowels and short vowels and has five tones. However, short vowels do not appear in open syllables, and only two tones appear with syllables which end with p, t or k. We could find all of the possible combinations with meaningful words.

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1 M1 M2
C1V1C2 # V2

The morpheme boundary was between C2 and V2, which were the last consonant of morpheme 1 and the initial vowel of morpheme 2, respectively.

2 M1 M2
C1V1 # C2V2

The morpheme boundary was between V1 and C2, which were the last vowel of morpheme 1 and the initial consonant of morpheme 2, respectively.

In the materials there were words of both cases.

Recording and measuring

Each word was read three times, and all the words were recorded. The materials were computer-analyzed on a High-Speed Speech Analysis System (Imagawa 1989). On a sonagram displayed on the monitor, we measured the durations of C1, V1, C2 and V2. We calculated the average of the three repetitions of C1, V1, C2 and V2 separately.

Results and Discussion

Indonesian

The measured durations are shown in Fig.1 and Fig.2. Fig.1 shows durations for stop consonants, and Fig.2 for nasal consonants. We could not find a difference between geminates and single consonants, but there were large fluctuations in each word.

In order to consider the possibility that the fluctuation in consonant duration was influenced by the speech rate, we calculated the ratio to the preceding vowel and to the following vowel. As for the preceding vowels, we could not find a difference between the

ratios, but we did find a large fluctuation in each word. The ratios to the following vowels are shown in Fig.3 and Fig.4. Here, we could find a slight difference: the ratios of geminates were a little larger than those of single consonants. So we concluded that the geminates were a little longer than the single consonants in comparison to the following vowels. As we mentioned above, geminate consonants appear at morpheme boundaries, but not within morphemes. It can be supposed that Indonesian speakers do not use duration as a cue for perceiving the difference between geminates and single consonants.

Thai

In Thai, a glottal stop is heard before syllables that begin with a vowel. So, if a syllable boundary is between C2 and V2, there is a glottal stop before V2. When C2 is a stop, the duration of C2 includes the period of glottal closure. When C2 is a nasal, the duration of C2 does not include the period of glottal closure. The measured durations did not show a difference between geminates and single consonants, but there was a large fluctuation in each word. The durations of the stops varied between 100ms and 250ms. those of the nasals varied between 60ms and 160ms.

For the same reason as in Indonesian, we calculated the ratios to the preceding vowels, and to the following vowels. We could not find a difference between the ratios with the following vowels. Ratios to the preceding vowel are shown in Figs.5 to 10: Fig.5, Fig.6 and Fig.7 show stops, and Fig.8, Fig.9 and Fig.10 show nasals.

As for stops, the ratios with a long preceding vowel were smaller than those with a short preceding vowel. Comparing the ratios of geminates to those of single consonants in these two cases, with a long preceding vowel and with a short preceding vowel, we could find no over-all difference. This is because a single consonant, C2, contained the duration of the glottal closure preceding V2. If we divided C2 into two parts, such as p, t or k and the glottal stop, the ratios of the geminates would be larger than those of the single consonants. We probably divide the closure period when we perceive the release of glottals, which have a different place of closure.

As to nasals, the ratios with the long preceding vowels were smaller than those with the short preceding vowels. Comparing carefully the ratios of geminates to those of single consonants in the two cases, we could find that the ratios of geminates were a little larger than those of single consonants with nasal C2=n, ŋ. But with C2=n this tendency was maintained only with a long preceding vowel.

We could find that geminates had larger ratios than single consonants, but there were counterexamples. Probably we need to examine other factors, such as tones, word length and word position.

We found no difference between geminates and single consonants in Thai and Indonesian, and only found fluctuations in the measured durations, both in Thai and in

Indonesian. We also found that in Indonesian, geminates were a little longer than single consonants in comparison to following vowels. Also, we found that in Thai, geminates were a little longer than single consonants in comparison to preceding vowels.

Indonesian is a polysyllabic language, while Thai is a monosyllabic language. It is supposed that this difference leads to the usage of different standard vowels; segment duration can be compensated within a word, even after the syllable, in Indonesian, and it can be compensated within the syllable in Thai. We can expect to catch the differences between syllables through the appearance of the segments which make up the syllable.

Further studies will be made to examine the perception of geminate consonants in relation to different syllables in Indonesian, Thai and Japanese.

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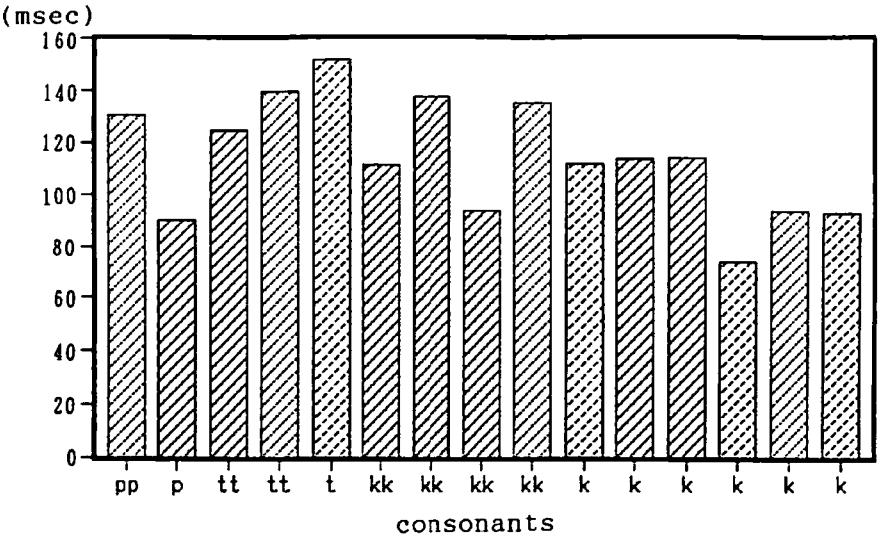

Fig.1 Durations of geminate and single stop consonants in Indonesian. There was no difference between geminates and single stops.

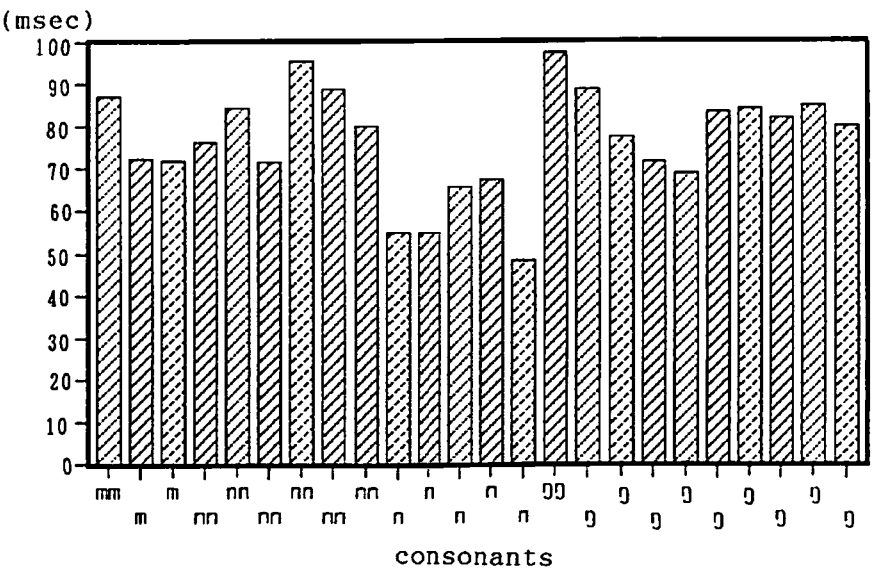

Fig.2 Durations of geminate and single nasal consonants in Indonesian. There was no difference between geminates and single nasals.

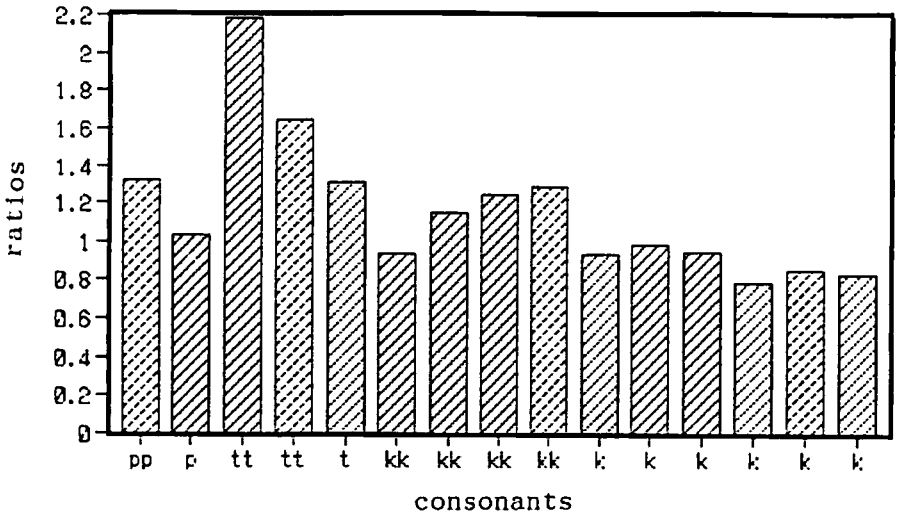

Fig.3 Ratios of durations of stop consonants to following vowels in Indonesian. The geminates are slightly longer than the single stops in comparison to following vowels.

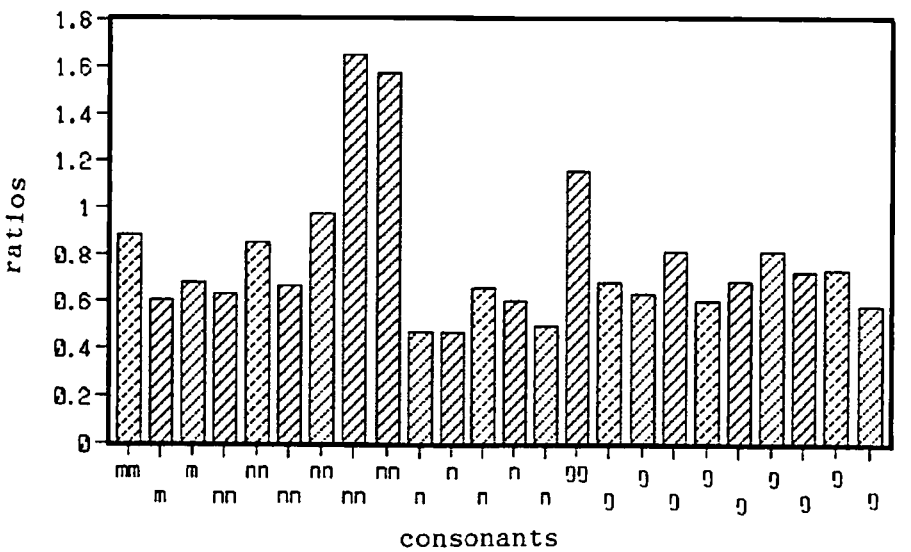

Fig.4 Ratios of durations of nasal consonants to following vowels in Indonesian. The geminates are slightly longer than the single nasals in comparison to following vowels.

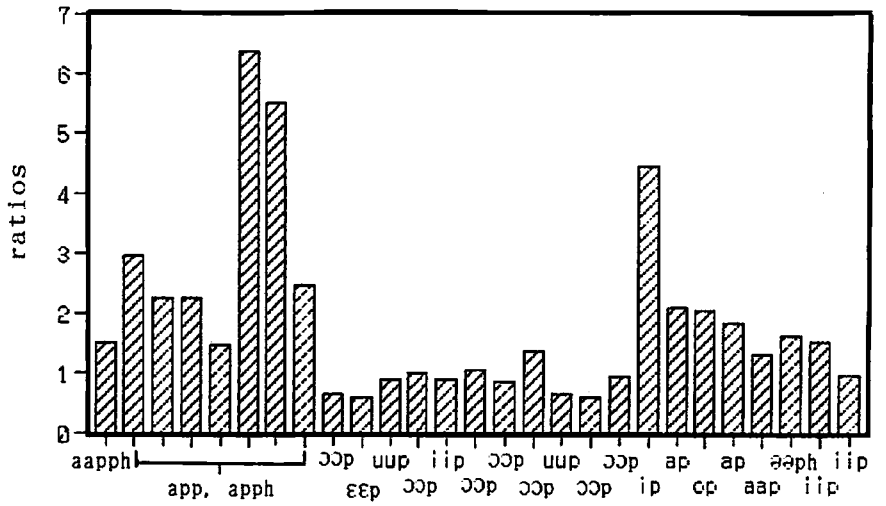

Fig.5 Ratios of durations of pp and p to preceding vowels in Thai. Ratios with a long preceding vowel were smaller than those with a short preceding vowel. But there was no difference between geminates and single consonants.

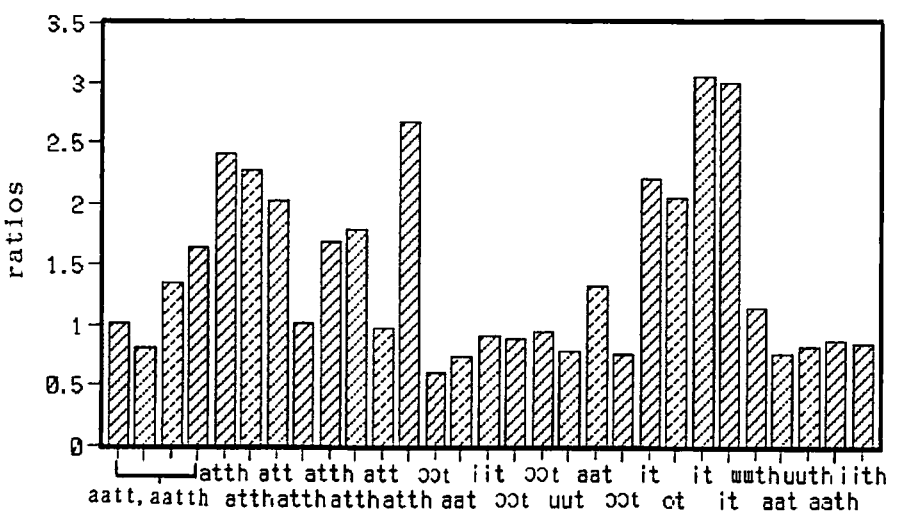

Fig.6 Ratios of durations of tt and t to preceding vowels in Thai. Ratios with a long preceding vowel were smaller than those with a short preceding vowel. But there was no difference between geminates and single consonants.

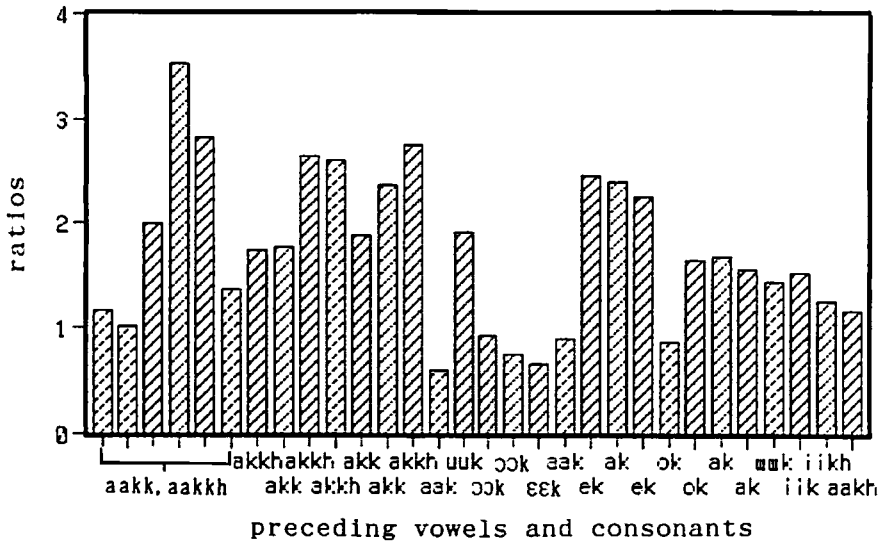

Fig.7 Ratios of durations of kk and k to preceding vowels in Thai. Ratios with a long preceding vowel were smaller than those with a short preceding vowel. But there was no difference between geminates and single consonants.

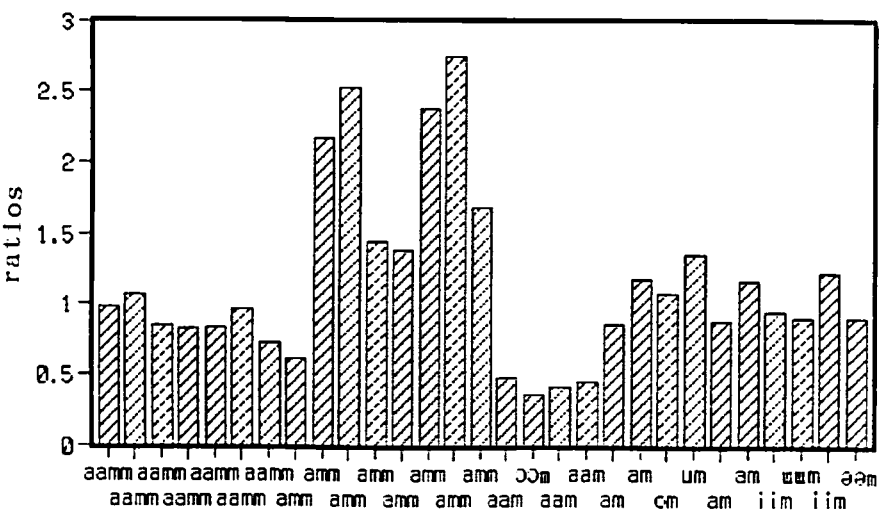

Fig.8 Ratios of durations of mm and m to preceding vowels in Thai. Ratios with a long preceding vowel were smaller than those with a short preceding vowel. And the geminates were a little longer than the single consonants in comparison to the preceding vowels.

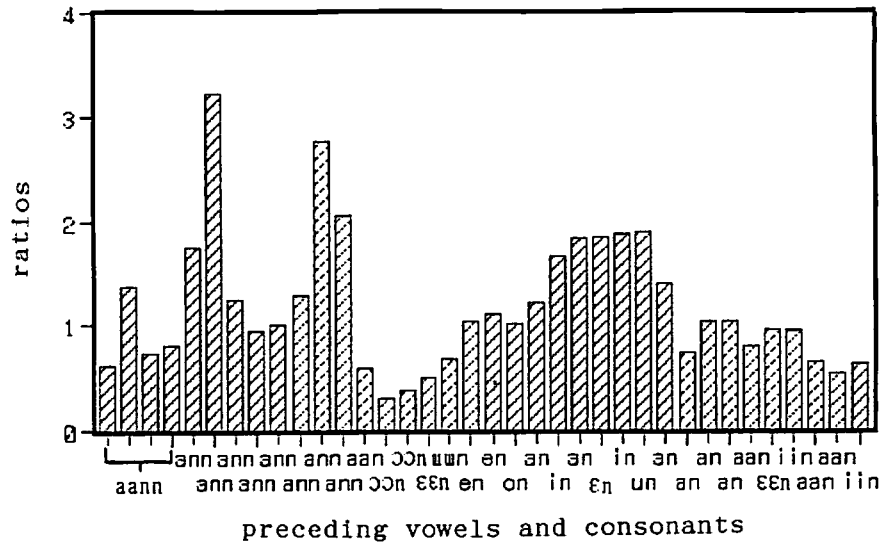

Fig.9 Ratios of durations of nn and n to preceding vowels in Thai. Ratios with a long preceding vowel were smaller than those with a short preceding vowel. But there was no difference between geminates and single consonants.

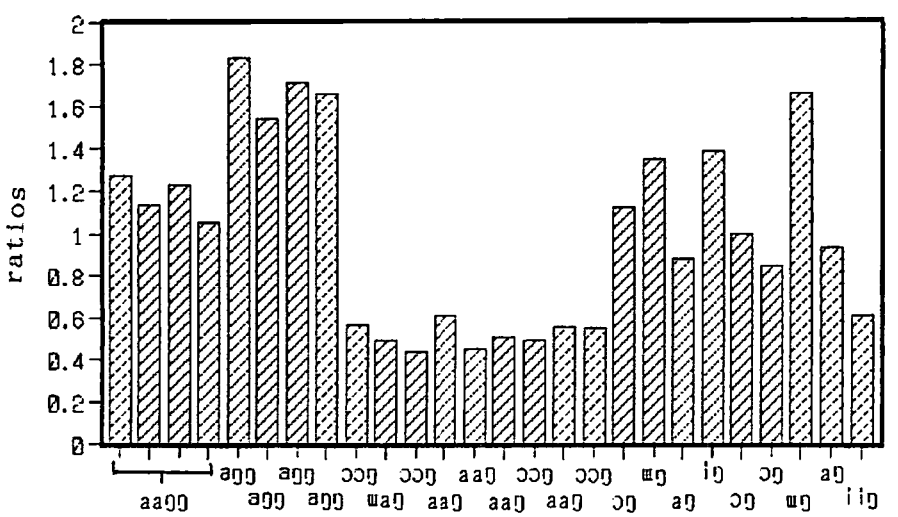

Fig.10 Ratios of durations of ŋŋ and ŋ to preceding vowels in Thai. Ratios with a long preceding vowel were smaller than those with a short preceding vowel. And the geminates were a little longer than the single consonants in comparison to the preceding vowels.